



# NATURAL RESOURCES PROGRAM

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TECHNICAL LETTER NASA - 17

U.S. Geological Survey  
Department of the Interior



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WASHINGTON, D.C. 20242

Technical Letter  
NASA-17  
August 1966

Dr. Peter C. Badgley  
Chief, Natural Resources Program  
Office of Space Science and Application  
Code SAR, NASA Headquarters  
Washington, D.C. 20546

Dear Peter:

Transmitted herewith are 2 copies of:

TECHNICAL LETTER NASA-17  
EVALUATION OF EKTACHROME AND MULTIBAND PHOTOGRAPHY  
IN CALIENTE RANGE, CALIFORNIA\*

by

J. G. Vedder and E. W. Wolfe\*\*

Sincerely yours,

William A. Fischer  
Research Coordinator  
Earth Orbiter Program

\*Work performed under NASA Contract No. R-09-020-015

\*\*U.S. Geological Survey, Menlo Park, California



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

TECHNICAL LETTER NASA-17  
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IN CALIENTE RANGE, CALIFORNIA\*

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J. G. Vedder and E. W. Wolfe\*\*

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These data are preliminary and should  
not be quoted without permission

Prepared by the Geological Survey  
for the National Aeronautics and  
Space Administration (NASA)

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\*\*U.S. Geological Survey, Menlo Park, California

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EVALUATION OF EKTACHROME AND MULTIBAND PHOTOGRAPHY  
IN CALIENTE RANGE, CALIFORNIA

by

J. G. Vedder and E. W. Wolfe  
U.S. Geological Survey, Menlo Park, California

An area in the Caliente Range of southern California, secs. 17, 18, 19, T11N, R21E, was selected for a trial of aerial Ektachrome and multiband photography. One test area which is approximately a mile square, is underlain by a northeast-dipping homoclinal sequence of Tertiary marine and nonmarine sedimentary rocks and basalt. Good exposure and detailed geologic mapping (Vedder and Repenning, 1965) make the area particularly well suited for study. The flight was made on a November afternoon, and deep shadow obscures geologic features in the more rugged parts of the area.

Features particularly striking in the multiband image include the following:

(1) White to pale "salmon" arkosic sandstone beds in unit Tc<sub>3</sub> and resistant white sandstone beds in unit Tbc show up in the multiband composite as well defined red zones. The sandstone beds, especially those in the western part of the area, are much less obvious in the Ektachrome image.

(2) Similar red zones occur on the floors of some canyons southwest of the "Main" basalt (Tb<sub>5</sub>). Probably they reflect the occurrence of alluvial white sand on the canyon floors. At best, this feature is barely discernible on the Ektachrome.

(3) Although striking on the Ektachrome image, the "Main" basalt ( $Tb_5$ ) is one of the most obvious features of the multiband image, where it is represented by a purplish northwest-trending band sharply bounded to the southwest and northeast. The southwest contact, well defined on the Ektachrome, and even more vividly defined on the multiband image is the basal contact of the basalt. The northeast boundary of the purplish band lies stratigraphically below the top of the basalt; it defines the ridge crest and, perhaps only coincidentally, the contact between exposed basalt in place and basalt talus on the northeast-facing dip slope.

Features with equivalent definition in the two images include the following:

(1) Bedding in several of the sedimentary units such as  $Tm$ ,  $Tcs$ , and  $Tc_3$  is well defined.

(2) Talus from the "Main" basalt ( $Tb_5$ ) is clearly displayed of the slope southwest of the basalt.

(3) Contacts of unit  $Tq$  are well defined on both images.

(4) Surficial expression of unit  $Qoa$  is equally good in the two images.

(5) Unit  $Tc_5$  and the base of unit  $Tc_4$  are obscure in both images.

Features less well defined in multiband image than in aerial Ektachrome include the following:

(1) Distribution of  $Qya$  and  $Ql$ . Some of the landslide deposits near the southeast edge of the area, though well defined on the Ektachrome,

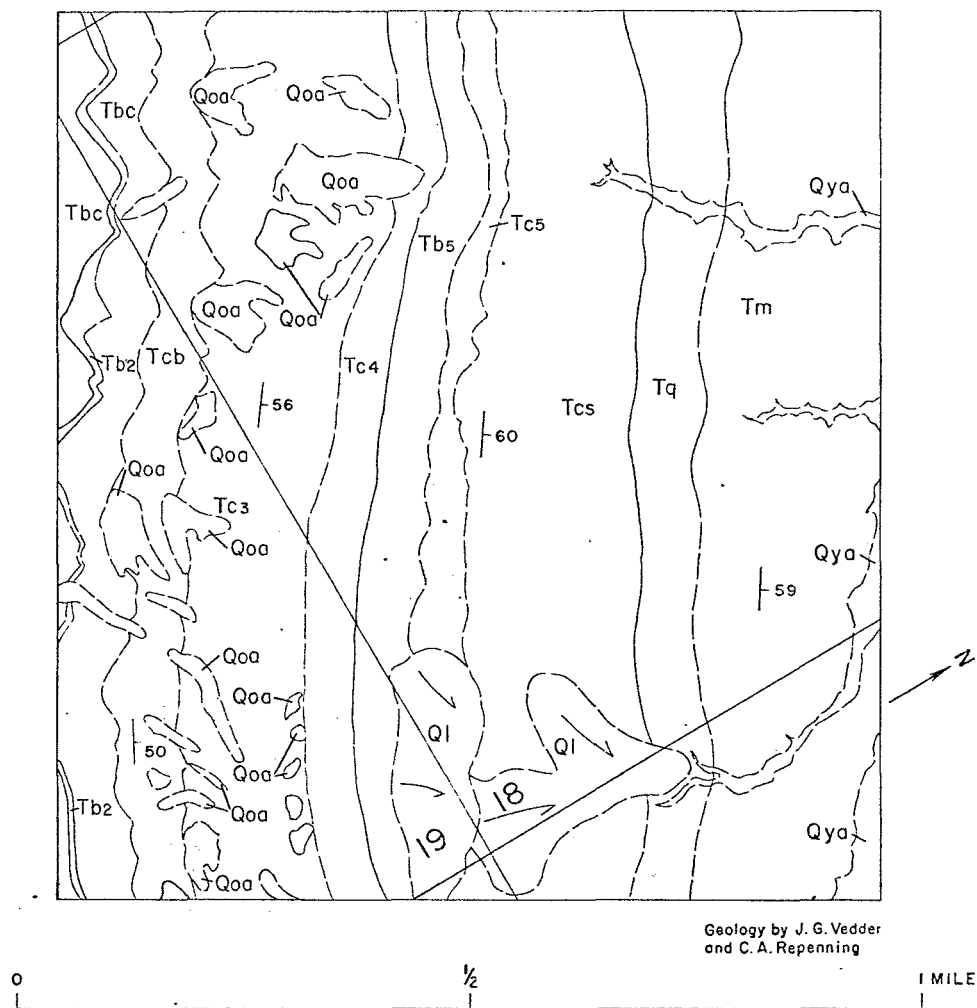
are virtually invisible on the multiband image.

(2) Definition of the drainage pattern is excellent on the Ektachrome and poor in the multiband image, probably because of poor registry in preparation of the multiband composite.

#### Conclusions:

Aerial Ektachrome photography would be extremely valuable in mapping unknown terrane with color contrast of rock units. However, few rock types could be interpreted without on-site inspection, and for detailed geologic study such photography would greatly aid but not replace on-the-ground geologic mapping.

This trial indicates that multiband methods can be used to discern specific geologic features such as the white sandstone beds of units Tc<sub>3</sub> and Tbc. The implications are that the multiband technique has promise as a remote-sensing analytical tool and that it could be of great value in rapid quantitative analysis of such features as sedimentary facies. Obviously further development of the technique and of our interpretative capability is essential to optimum use of the tool.





# EXPLANATION

